OBJECTIVE 22: EMERGENCY WORKERS, EQUIPMENT, AND VEHICLES - MONITORING AND DECONTAMINATION

OBJECTIVE

Demonstrate the adequacy of procedures for the monitoring and decontamination of emergency workers, equipment, and vehicles.

INTENT

This objective is derived from NUREG-0654 which provides that OROs should develop action levels for determining the need for emergency worker decontamination and demonstrate capabilities to decontaminate emergency workers, supplies, and equipment. (See evaluation criteria from Planning Standards H., K., and N.)

This objective is based on the fact that emergency workers may have to perform emergency response duties in areas where they may be exposed to radioactive materials and become contaminated. Equipment and vehicles used by emergency workers may also become contaminated. For this reason, special facilities are set up where emergency workers, equipment, and vehicles can be monitored for contamination and decontaminated, when necessary.

DEMONSTRATION CRITERIA

NUREG	CRITERION	
H.10., K.5.a.,b.	**1.**	**Resources and facilities for monitoring emergency workers and equipment (including vehicles) and for contamination control are adequate and appropriate.**

Explanation

The OROs should demonstrate their capability to activate and operate a facility for the monitoring and decontamination of emergency workers and equipment, including vehicles. They should also demonstrate their capability to notify emergency workers of the availability and location of the monitoring and decontamination facility. A monitoring and decontamination facility is considered operational when the following steps are completed:

- Monitoring and decontamination supplies and equipment are in place and confirmed as operational

- Protective coverings, instructional signs, and other planned methods for minimizing

contamination of the facility are in place

- A sufficient number of the facility staff have arrived and are ready to perform monitoring and decontamination activities

It is expected that the emergency worker monitoring and decontamination facility(ies) will be located outside the plume emergency planning zone and that it will consist of two basic parts: (1) a structure containing monitoring and decontamination equipment and supplies for emergency workers and which has provisions or procedures for separate male and female showers, and (2) an open area for monitoring and decontamination of vehicles and equipment with the parking space separated for contaminated vehicles and clean vehicles.

The facility staff should demonstrate that they have the capability to minimize possible contamination of the facility used for emergency workers through use of a floor covering (e.g., absorbent paper with plastic backing, cloth, reinforced plastic sheet, etc.) for an entrance pathway. The staff should demonstrate the capability to ensure that all areas designated for use by contaminated emergency workers have temporary floor covering and signs, and appropriate means (e.g., partitions, curtains, roped-off areas) to segregate clean from potentially contaminated areas. Arrangements should be made to prevent cross contamination between clean areas, individuals, vehicles, and equipment and contaminated areas. Special arrangements for the collection and containment of water used for decontamination are not necessary for protection of the environment and public health and safety. Water from decontamination activities may go directly to a storm sewer or other sewer or drain system or area normally designated for waste water that has been used for bathing or washing of vehicles and equipment.

Provisions should be available for storage of contaminated clothing and solid waste in a location that will not significantly affect the background radiation levels in monitoring areas. Contaminated clothing may be bagged and returned to the owner at a later time.
The facility staff should demonstrate that they have operable survey instruments at the facility. These instruments should be labeled on the exterior, or otherwise identified, with the instrument responsiveness to an identified check source.

Instrumentation used for monitoring should include portable or portal survey instruments. Portable survey instruments have a single probe containing a Geiger-Mueller type radiation detector that detects both beta and gamma radiation. Portal monitors are radiation detection instruments that have several radiation detectors fixed in a frame. Portal monitors are designed primarily for monitoring individuals, whereas the portable single probe type survey instruments (e.g., a CD V-700) is suitable for monitoring any surface.

Instruments used for checking for contamination do not require recalibration; however, they should be accompanied by a radioactive check-source that can be used as a single point

calibration check. In some cases these check-sources may be attached to the instrument (e.g., the CD V-700) or separate (e.g., a portal monitor). Information should accompany each instrument as to the proper reading (or range of readings) for the check source accompanying or attached to the instrument. This information is usually included on a label on the instrument.

Portable survey instruments used for contamination checks should be equipped with earphones or speakers so that the monitoring technicians can watch where they are moving the probe without being distracted to read the meter indicator. The probes should be covered with thin plastic to provide an easy way to remove any contamination that might get on the probe. A plastic thickness of 1 to 2 mils (e.g., a sandwich bag) will be thin enough to avoid any significant reduction in response from the beta radiation. Transparent plastic may be helpful to permit a visual determination of whether the beta shield on the probe is opened or closed; however, this is not required.

Prior to using an instrument(s) for monitoring, the monitoring technician should demonstrate the process of checking the instrument(s) for proper operation. In the case of a probe-type instrument, this involves checking the battery status, measuring the radiation from the accompanying check-source, and comparing the result to the proper reading stated on the label. In the case of a portal monitor, this involves turning the instrument on, checking for power indication, operating and observing any check circuits, and counting the check source according to procedure for source location and counting time. Once the operability of the monitoring instrument is confirmed, background radiation levels should be determined in the immediate vicinity where individuals will be monitored. An instrument that does not respond properly to these parameters should not be used. Members of the monitoring staff should demonstrate the capability to perform the above functions prior to the operation of the monitoring equipment.

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Extent of Play

Demonstration of this objective requires that at least one emergency worker monitoring and decontamination facility be activated along with all appropriate personnel, equipment, and supplies. This facility should be set up as it would be in an actual emergency with all route markings, instrumentation, record keeping, and contamination control measures in place.

Demonstration may be conducted out-of-sequence with the exercise scenario. This should be arranged with the FEMA Regional Assistance Committee (RAC) Chair in advance of the exercise and specified in the extent-of-play agreement.

Operations should be set up so that the evaluator can determine how the facility will be configured for the completion of various activities.

Alternatively, capabilities may be demonstrated by setting up stations and demonstrating procedures to check for contamination of personnel, equipment, and vehicles.

Given the substantial differences between demonstration and simulation of this objective, extent of play must be clearly specified in the extent-of-play agreement.

NUREG	CRITERION	
K.5.a.,b.	**2.**	**Emergency workers are monitored for radioactive contamination and decontaminated as appropriate.**

Explanation

The monitoring and decontamination facility staff should demonstrate the capability to use portable beta-gamma survey instruments and portal monitors (if included in the plan) for monitoring emergency workers. Monitoring procedures should be demonstrated on individuals.

For the demonstration of portable survey instruments, earphones or speakers should be used, and the probe, with the beta shield open and facing the contaminated surface, should be moved over the entire body of individuals at a close distance from the surface and at a relative slow speed as designated by the plan.

Portal monitors are used for monitoring individuals by having the individual stand inside the monitoring framework for a specified period of time while the instrument integrates the amount of radiation received. The duration of the integration is dependent on the type of portal monitor, the background radiation in the area, and the minimum detection level

required. These parameters should be determined from the plan.

The monitoring staff should demonstrate the capability to make decisions on the need for decontamination of individuals during the emergency phase based on guidance levels and procedures stated in the plan or, alternatively the following: (1) 300 counts per minute (cpm) above background or beta plus gamma radiation with a CD V-700 survey instrument, or equivalent; (2) one microcurie of Cs^{137} beta/gamma activity from a sealed source with a portal monitor. (These levels are currently being reevaluated.)

The monitoring staff should demonstrate the capability to decontaminate emergency workers through the use of procedures entailing removal and control of contaminated clothing and other articles and the proper sequence for use of washing facilities, remonitoring using portable instruments, and decisions to refer individuals who cannot be decontaminated to medical or other facilities for special analyses or treatment. In the absence of guidance in the plan, the recommended action level for referral of individuals with fixed contamination to medical facilities for diagnosis and treatment is usually in the range of 5,000 to 10,000 cpm using a CD V-700 survey instrument or equivalent. (These values are being reevaluated.)

Records of monitoring activities and findings should be maintained in accordance with the plan.

Extent of Play

Under this criterion, procedures for monitoring personnel should be performed as they would be in an actual emergency, using someone from the response organization or an evaluator to simulate an emergency worker returning from field assignment. Facility staff should demonstrate record-keeping procedures for each contamination check station within the facility.

The individual's injuries may be indicated on an attached tag or controller inject. Contamination of the individual or the individual's clothing should not be simulated through the use of lantern mantles or other low-level radiation sources such as a radium dial watch.

Decontamination capabilities may be simulated by conducting a walk-through of the facility which provides the evaluator an opportunity to evaluate physical layout of the facility, equipment, supplies, procedures, and personnel through observation and inquiries.

NUREG		CRITERION
K.5.b.	**3.**	**Vehicles and equipment are monitored and decontaminated as**

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appropriate.

Explanation

Facility staff should demonstrate their capability to monitor and decontaminate vehicles and equipment. Facility staff should also demonstrate the capability to avoid the build-up of the background radiation levels in the monitoring area through the use of a separate area for storage of contaminated vehicles, equipment and waste.

Monitoring of vehicles and equipment should be demonstrated using portable survey instruments. All instrumentation should have been checked for operability and proper reading of check sources as indicated under Demonstration Criterion 1.

It is generally not necessary to monitor the entire surface of vehicles. However, areas such as air intake systems, air filters, radiator grills, bumpers, wheel wells and tires of vehicles, and door handles, as a minimum, should be monitored. Interior surfaces of vehicles that were in contact with individuals found to be contaminated should also be checked.

The monitoring staff should demonstrate the capability to make decisions on the need for decontamination of vehicles and equipment during the emergency phase based on guidance levels and procedures stated in the plan or on the following: 300 cpm above background of beta plus gamma radiation with a CD V-700 survey instrument, or equivalent. (These levels are currently being reevaluated.)

After decontamination during the emergency phase, the recommended limit is five milliroentgens per hour (mR/h) on a CD V-700 survey instrument for fixed contamination, contamination with the measurements being made with the beta shield closed. Vehicles and equipment which meet these limits may be released for general use. Contaminated vehicles or equipment which cannot be decontaminated to this limit or below, should not be released for general use without further review by health physics staff. (These levels are currently being reevaluated.)

The facility staff should demonstrate the capability to avoid cross-contamination of clean personnel and equipment. Procedures to support this capability should include the use of gloves by monitoring personnel, and procedures to ensure that clean workers do not come into contact with contaminated vehicles and equipment and that contaminated workers do not come into contact with clean vehicles and equipment. This can usually be accomplished by the establishment of traffic patterns and by the use of temporary absorbent covers for portions of walkways that will be used by potentially contaminated individuals.

Extent of Play

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The area to be used for monitoring and decontamination should be set up as it would be in an actual emergency in order to provide an opportunity for evaluators to conduct a walk-through inspection of the area. Monitoring procedures should be demonstrated using a vehicle simulated to have come from a contaminated area. Decontamination capabilities may be simulated by conducting a walk-through of the facility which provides the evaluator an opportunity to evaluate physical layout of the facility, equipment, supplies, procedures, and personnel through observation and inquiries.

NUREG	CRITERION	
K.5.a.,b.	**4.**	**All activities described in the demonstration criteria for this objective are carried out in accordance with the plan, unless deviations are provided for in the extent-of-play agreement.**

Explanation

The monitoring and decontamination facility staff should demonstrate the capability to follow policies, implement procedures, and utilize equipment and facilities contained in their plans and procedures. They should demonstrate that they can follow sequences outlined in the various procedures and perform specified activities as necessary.

Extent of Play

Under this criterion, all activities should be carried out as specified in the plan, unless deviation from the plan is provided for in the extent-of-play agreement.

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CLARIFICATION OF TERMS

The following definitions describe the limited meaning of terms in the context of the Exercise Evaluation Methodology and may vary from the full technical definition for all circumstances.

Action levels refers to thresholds for contamination levels that trigger the need for decontamination established in the plan.

Check source refers to a radioisotope with a relatively fixed activity level used to determine the responsiveness of survey instruments.

Counting refers to using an instrument to detect individual particles or gamma rays which interact with the detector on the instrument. For example, ambient radiation can be counted, or, alternatively, the radiation emitted by specific samples can be counted.

Emergency operations center refers to a facility that is the primary base of emergency operations for an ORO in a radiological emergency.

Emergency worker refers to an individual who has an essential mission within or outside the plume exposure pathway emergency planning zone to protect the health and safety of the public who could be exposed to ionizing radiation from the plume or from its deposition. Some examples of emergency workers are: radiation monitoring personnel; traffic control personnel; evacuation vehicle drivers; fire and rescue personnel, including ambulance crews; medical facilities personnel; emergency operations center personnel; personnel carrying out backup alerting procedures; and essential services or utility personnel.

Facility refers to any building, center, room(s), or mobile unit(s) designed and equipped to support emergency operations.

Fixed contamination refers to contamination that remains after loose contamination has been removed by decontamination.

Geiger-Mueller detector refers to a type of radiation detector that can be used to measure the gamma, or beta plus gamma radiation depending on whether the detector is covered by a beta shield.

Measuring refers to counting to detect radiation levels or determining other parameters, such as the energy of radiation or physical characteristics of samples, such as the volume of an air sample.

Monitoring refers to the measurement of radiation levels, usually with a portable survey

instrument.

Monitoring and decontamination facility refers to a temporary facility established outside the plume emergency planning zone for the purpose of monitoring and decontaminating emergency workers, and their vehicles and equipment used in the plume and/or areas contaminated by the plume.

Portal monitor refers to a radiation monitor consisting of several radiation detectors arranged in a fixed position within a frame that forms a passageway for individuals being monitored.

Walk-through refers to a type of evaluation in which evaluators inspect the physical layout of a facility or area including equipment, attendant resources, and procedures to determine conformity with specific ORO plans.